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Sensing of polyethylene glycols using a channel of the connector from the Phi29 bacteriophage

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Nanopore sensor is a novel detection technology that uses a nano-sized pore formed either by channel proteins or by synthetic materials for detecting characteristic currents when analytes pass through it. The phi29 connector is a channel protein that *in-vivo* serves as a path for the genome DNA to enter the capsid of the bacteriophage phi29. Recently our work have shown the protein channel can be embedded into a bilayer membrane and, under an electric field, ionic current induced by ds-DNA translocation though the channel can be detected. The results suggest the channel protein would be possibly used as a central motif in the nanopore sensor.

In this study, a phi29 mutant connector containing a six histidine-tag was prepared and inserted into a bilayer membrane for nanopore sensing. A series of hydrophilic polymers, PEGs, with molecular weights ranging from 3000 Da-200000 Da are firstly used as analytes. In an identical electrolyte solution containing PEG with different molecular weights, the ionic currents induced by a single channel are recorded and compared. It was found that the single channel conductance is strongly influenced by the molecular weights of the used PEG. Since the size of a PEG molecule is determined by its molecular weight, a relationship between the resultant conductance and the size of the used PEGs has been established. The results also indicate a possibility of using the PEG to probe the internal geometry of the C-His connector channel.

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